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Sexual orientation-related disparities in employment, health insurance, healthcare access, and health-related quality of life: a longitudinal cohort of U.S. males and females

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ABSTRACT

Objectives: To investigate sexual orientation-related disparities in employment and healthcare including potential contributions to disparities in health-related quality of life (HRQL).

Setting: Growing Up Today Study, an ongoing a U.S.-based longitudinal cohort that began in 1996 and is primarily white and of middle-to-high socioeconomic positions.

Participants: 9,914 young adult participants aged 18-32 years of age at the most recent follow-up questionnaire.

Primary outcome measure: In 2013, participants reported if, in the last year, they had been unemployed, uninsured, or lacked healthcare access (a routine physical exam). Participants also completed the EQ-5D-5L, a validated, preference-weighted measurement of HRQL. After adjusting for potential confounders, we used sex-stratified, log-binomial models to calculate the association of sexual orientation with employment, health insurance, and healthcare access while also examining if these variables attenuated the sexual orientation-related HRQL disparities.

Results: Sexual minority females and males were about twice as likely as their respective heterosexual counterparts to have been unemployed and uninsured. Routine physical examination was not statistically different across sexual orientation groups. All sexual minority subgroups had worse HRQL than heterosexuals across each of the five EQ-5D-5L dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression). Controlling for employment and health insurance did not substantially attenuate the existing sexual orientation-related HRQL disparities.

Conclusions: Previous research on sexual orientation-related disparities in employment and healthcare have often been limited to comparisons between cohabitating different- and same-sex adult couples, overlooking sexual minority subgroups (e.g., bisexuals versus lesbians), non-cohabitating populations, and young people. Less is known about sexual orientation-related disparities in HRQL including potential contributions from employment and healthcare. The current study documents that sexual orientation-related disparities in employment, health insurance, and various HRQL dimensions are pervasive across sexual minority subgroups, non-cohabitating couples, and young people even in U.S. families of middle-to-high socioeconomic positions.

ARTICLE SUMMARY: STRENGTHS AND LIMITATIONS OF THIS STUDY
- Cohort has predominantly high social status so findings may underestimate the prevalence of unemployment, a lack of health insurance, a lack of healthcare access, and poor HRQL
- There may be other factors that mediate the sexual orientation-related HRQL disparities including bullying victimization, social status, and others
- Data were cross-sectional and limited on some of our variables such as health insurance and healthcare access
- Includes a large sample drawn from young adults living across the United States
- This is the first study to examine these disparities across HRQL domains and evaluate the role of additional factors including employment, health insurance, and healthcare access

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THUMBNAIL SKETCH
What is already known on this subject?
Compared to cohabitating couples in different-sex relationships, those in same-sex couples are more likely to be unemployed, lack health insurance, and lack healthcare access. However, we know little about other key populations such as those not cohabitating. Less is known about sexual orientation-related disparities in health-related quality of life including potential contributions from employment and healthcare.

What this study adds?
Sexual orientation-related disparities in employment and health insurance are pervasive even in U.S. families of middle-to-high socioeconomic positions. Until all people, regardless of sexual orientation, are treated equally in the eyes of the law with non-discrimination laws protecting employment as well as housing, public accommodations, and credit/lending, sexual orientation-related health disparities will persist.

INTRODUCTION

Half of all sexual minorities (e.g., lesbian, gay, and bisexual individuals) report employment discrimination in their lifetime[1]. Discrimination, along with other social and economic barriers, can lead to unemployment and, subsequently, a lack of health insurance and healthcare access. All of these factors may contribute to poor health-related quality of life (HRQL), which is a critical measure of health status. Comparing HRQL across different subpopulations can highlight disparities as well as help to evaluate the cost effectiveness of policies or programs that reduce such disparities[2].

Previous research has documented that, compared to heterosexuals, sexual minorities are more likely to: be unemployed, lack health insurance, and lack healthcare access[3–13]. However, these data are often limited to comparisons between cohabiting different-sex couples and same-sex adult couples, which precludes examination of differences in any other aspects such as among sexual minority subgroups (e.g., bisexuals versus lesbians), non-cohabitating groups, or young people. A few previous studies have also revealed that sexual minorities, on average, have worse quality of life than heterosexuals[14–19]. But, most of these data depend on limited measures of quality of life including measures that do not explicitly access HRQL, including its multiple dimensions, and few of these studies have examined potential mediators of the sexual orientation-related disparities in HRQL.

Documenting such disparities can provide policymakers with evidence to inform legislation that can lessen health inequities. For example, over half of states across the U.S. currently have no employment non-discrimination law covering sexual orientation[20] and documenting employment disparities, along with the potential downstream consequences—health insurance, healthcare access, and HRQL—can provide insight into the impact of policy changes. Therefore, the goal of this study was to leverage data from a U.S.-based longitudinal cohort of adolescents and young adults to examine sexual orientation-related disparities in employment, health insurance, and healthcare access while evaluating their contributions to HRQL disparities.

METHODS
Study Population

For the last 20 years, questionnaire data have been collected annually in the Growing Up Today Study (GUTS) from the female and male offspring of Nurses' Health Study 2 (NHS2) participants. The first wave of GUTS participants (GUTS1) was enrolled in 1996, when they were 9-14 years of age, and another wave of 9-16 year olds was enrolled in 2004 (GUTS2) making the entire cohort 19-31 years of age at the last questionnaire wave in 2013. We originally sent questionnaires to GUTS1 and 2 in alternating years but since 2013, we have combined GUTS1 and 2 into a single annual questionnaire. Participants' race/ethnicity is primarily white and most of their families report a middle-to-high household income (64% of participant's annual household income during their childhood was ≥$75,000).

The current analysis was limited to GUTS participants who reported their sexual orientation and information on the measures of unemployment, health insurance, healthcare access, and HRQL between baseline and the end of follow-up in 2013 (N=9,914). This study was approved by the Brigham and Women's Hospital Institutional Review Board.

Measures
Sexual orientation

Detailed information about sexual orientation has been repeatedly collected in GUTS 1 and 2 using an item adapted from the Minnesota Adolescent Health Survey[21], which asks about feelings of attraction and identity. The item read "Which of the following best describes your feelings?'' with the following response options: completely heterosexual (attracted to persons of the opposite sex), mostly heterosexual, bisexual (equally attracted to men and

women), mostly homosexual, completely homosexual (gay/lesbian, attracted to persons of the same sex), and not sure.

Sexual orientation groups were modeled using the 2013 questionnaire data (the same questionnaire year as the latest outcome) as follows: completely heterosexual (reference group), mostly heterosexual, bisexual, and lesbian/gay (made up from the mostly homosexual and completely homosexual groups). Missing data were imputed from previous questionnaire waves. Respondents endorsing "not sure" were excluded (n=69).

Unemployment

In 2010 (GUTS 1 only) and 2013, participants reported their employment status. Response options included: working full time, working part time, student, volunteering, military, unemployed/laid off/looking for work, staying at home with children/taking care of family, on maternity or family leave, and not working due to illness or disability. We categorized a participant as being unemployed/not working due to illness or disability in 2013 if they provided an affirmative response to the "unemployed/laid off/looking for work" item or the "not working due to illness or disability".

Lacking health insurance

The 2013 questionnaire asked participants whether they were covered by any kind of health insurance or healthcare plan (yes; no). We categorized a participant as lacking health insurance in 2013 if they reported no such coverage.

Lacking healthcare access through routine physical exam

Use of routine physical exams was measured by asking about timing of last routine physical exam in 2013. We categorized participants who reported their last routine physical exam occurred >12 months before the questionnaire completion as not having healthcare access through a routine physical exam.

HRQL

The 2013 questionnaire assessed HRQL using the EQ-5D-5L[22], which is a validated, preference-weighted measure. EQ-5D-5L is a standardized, generic instrument that is applicable to a wide range of health conditions and appropriate for use with adolescents and young adults. This measure can also be used to calculate quality-adjusted life years (QALYs) for economic analyses with U.S.-based population weights.

EQ-5D-5L assesses HRQL in five dimensions (mobility, self-care, usual activities, pain/discomfort, anxiety/depression) by having participants report a dimension-specific score (1=no problems, 2=slight problems, 3=moderate problems, 4=severe problems, and 5=extreme problems). Based on the EuroQol Group recommendations[23], each physical functioning dimension was dichotomized into a score of 1 being "no problems" versus scores of 2 to 5 being "any problems." The anxiety/depression dimension was dichotomized into scores of 1 to 2 being "none or slight problems" versus scores of 3 to 5 being "moderate, severe, or extreme problems," as has been done previously[24].

All five dimensions were then used to create a summary HRQL index score[25]. Because EQ-5D-5L value sets are not yet available for the U.S., in order to preference-weight the index score for U.S. populations we relied on another value set to map EQ-5D-5L responses to the previous version, the EQ-5D-3L[26]. This summary results in an index score that is calibrated to reflect the degree to which different health statuses are valued in the U.S. population overall. Index scores for the U.S. population range from most severe impairment on all five dimensions, termed "worse than death" (value= -0.109), to full health (value=1.0)[27]. Previous research suggests that an index score difference as small as 0.02 points can have a

clinically meaningful difference[28]. We also analyzed the HRQL index score after dichotomizing it as a score of 1 being "full health" versus <1 being "not full health."

Confounders

Potential confounders included baseline age in years, race/ethnicity (White, another race/ethnicity), childhood socioeconomic position (annual household income from NHS2 report in 2001 [<$50,000; $50,000-$74,999; $75,000-$99,999; ≥$100,000]), sex/gender, marital status in 2013 (married; not married), region of residence (West, Midwest, South, or Northeast), and cohort (GUTS 1, 2). If a participant's data were missing for potential confounders, data were imputed from previous questionnaire years; if no such data were available for a participant then multiple imputation procedures were used.

Statistical Analysis

We first examined cross-sectional mean differences in employment, health insurance, healthcare access, and HRQL measures across sexual orientation groups. Multivariate regression from log-binomial models was used for dichotomous outcomes to calculate risk ratios (RR) and 95% confidence intervals (95%CI). Linear regression with the robust sandwich estimator was used for continuous outcomes to calculate betas (β) and standard errors. In order to account for sibling clusters, we estimated the variance using generalized estimating equations (GEE) with a compound symmetry working correlation matrix.

We calculated the risk ratios of experiencing unemployment, lacking health insurance, or lacking healthcare access by sexual orientation groups (referent=completely heterosexual), adjusted for potential confounders. Analyses for HRQL measures followed the previously used two-step approach[29,30] by first dichotomizing the index score (1 versus <1) and then using the continuous health index score in analyses restricted to those with lower HRQL (defined as health index scores <1). HRQL models were first adjusted for potential confounders and then adjusted for employment, health insurance, and healthcare access to explore attenuation. Previous research with this cohort[14] suggests possible effect modification of the sexual orientation and HRQL association by sex/gender but not by cohort so all analyses were stratified by sex/gender and adjusted for cohort. Analyses were conducted using SAS 9.3 (SAS Institute, Cary, NC).

RESULTS

Of the 9,914 participants in our sample, 7.5% were unemployed or not working due to illness or disability, 4.9% were uninsured, and 38.2% lacked healthcare access through a routine physical exam in the last year. As shown in Table 1, all of these outcomes varied by sexual orientation identity with sexual minorities having more unemployment, less health insurance, and less healthcare access (all *p*-values <0.01 except among men, where healthcare access was not statistically different across sexual orientation groups). The mean HRQL index score was 0.90 for females and 0.92 for males and varied by sexual orientation identity with sexual minorities having lower mean HRQL index scores compared to completely heterosexuals among both females and males (*p*-values <0.001). Within each of the five HRQL domains, sexual minority females and males were more likely than heterosexuals to report worse health (*p*-values ranged from <0.001 to 0.02 except among men, where self-care was not statistically different across sexual orientation groups).

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Table 1. Age standardized characteristics of a cohort of U.S. females and males by sex/gender and sexual orientation (N=9,914).

Female (N=6,663)	Completely heterosexual (N=5,353)	Mostly heterosexual (N=1,037)	Bisexual (N=159)	Lesbian/Gay (N=114)	p-value[1]
Age at baseline[2], mean years (SD), Range: 18-32	26.1 (3.6)	26.6 (3.4)	25.5 (3.6)	26.4 (3.5)	<0.001
Unemployed/not working due to illness or disability in last year[3], % (N)	5.9 (317)	10.5 (109)	14.5 (23)	10.5 (12)	<0.001
Uninsured (lacked health insurance) in last year[3], % (N)	3.9 (208)	5.7 (59)	13.8 (22)	4.4 (5)	<0.001
Lacked a routine physical exam in the last year[3], % (N)	32.0 (1,712)	36.1 (374)	40.3 (64)	37.7 (43)	0.01
HRQL[4] dimensions, % (N)					
Mobility ≥slight problems	3.2 (172)	5.6 (58)	13.2 (21)	10.5 (12)	<0.001
Self-care ≥slight problems	0.5 (28)	1.3 (13)	4.4 (7)	1.8 (2)	<0.001
Usual activities ≥slight problems	5.0 (267)	12.3 (127)	20.1 (32)	16.7 (19)	<0.001
Pain/discomfort ≥slight problems	26.5 (1,418)	36.8 (382)	42.1 (67)	44.7 (51)	<0.001
Anxiety/depression ≥moderate problems	12.3 (658)	22.6 (234)	36.5 (58)	29.0 (33)	<0.001
HRQL index score[5], mean (SD)	0.91 (0.09)	0.87 (0.09)	0.84 (0.11)	0.85 (0.10)	<0.001
Less than full health (HRQL index score<1)	54.6 (2,924)	73.3 (760)	84.3 (134)	79.0 (90)	<0.001
HRQL index score among those with less than full health, mean (SD)	0.84 (0.06)	0.83 (0.06)	0.80 (0.09)	0.81 (0.08)	<0.001
Male (N=3,251)	(N=2,805)	(N=268)	(N=25)	(N=153)	
Age at baseline[2], mean years (SD), Range: 18-32	25.9 (3.7)	26.1 (3.7)	24.6 (3.8)	25.9 (3.6)	0.26
Unemployed/not working due to illness or disability in last year[3], % (N)	7.8 (218)	15.3 (41)	8.0 (2)	11.1 (17)	<0.001
Uninsured (lacked health insurance) in last year[3], % (N)	5.2 (147)	9.7 (26)	0.0 (0)	11.1 (17)	<0.001
Lacked a routine physical exam in the last year[3], % (N)	48.8 (1,369)	47.8 (128)	36.0 (9)	54.9 (84)	0.26
HRQL[4] dimensions, % (N)					
Mobility ≥slight problems	3.1 (86)	6.3 (17)	8.0 (2)	2.6 (4)	0.02
Self-care ≥slight problems	0.6 (18)	1.1 (3)	4.0 (1)	0.0 (0)	0.11
Usual activities ≥slight problems	3.8 (107)	10.5 (28)	8.0 (2)	5.9 (9)	<0.001
Pain/discomfort ≥slight problems	25.4 (711)	38.8 (104)	32.0 (8)	24.2 (37)	<0.001
Anxiety/depression ≥moderate problems	10.2 (285)	25.8 (69)	24.0 (6)	28.1 (43)	<0.001
HRQL index score[4], mean (SD)	0.92 (0.09)	0.87 (0.11)	0.86 (0.12)	0.89 (0.09)	<0.001
Less than full health (HRQL index score<1)	47.3 (1,329)	70.2 (188)	76.0 (19)	68.0 (104)	<0.001
HRQL index score among those with less than full health, mean (SD)	0.84 (0.06)	0.82 (0.08)	0.82 (0.11)	0.84 (0.06)	<0.001

[1]p-value calculated using ANOVA for continuous variables and chi square test for categorical variables (including those with a zero frequency cell such as the self-care HRQL dimension).
[2]Multiple imputation used in subsequent analyses for any missing covariates data. Percent missing: race/ethnicity (1.2%), marital status (0.2%), socioeconomic position (17.8%), and geographic region (0.1%).
[3]As reported in 2013.
[4]Health-related quality of life (HRQL) measured by the EQ-5D-5L, a validated preference-weighted measure for U.S. populations.
[5]Possible scores ranged from -0.109 ("worse than death") to 1 ("full health").

Table 2 presents the RRs and 95%CIs for the association between sexual orientation and the risk of being unemployed, lacking health insurance, or lacking healthcare access, adjusted for potential confounders. Compared to heterosexuals, sexual minority females and males were about twice as likely as their respective heterosexual counterparts to have been unemployed and uninsured. For example, bisexual females were at a higher risk than heterosexual females of being uninsured [RR (95%CI): 3.76 (2.42, 5.85)] and mostly heterosexual males were more likely than heterosexual males to have been unemployed [RR (95%CI): 1.82 (1.30, 2.54)]. Use of a routine physical exam was not statistically different across sexual orientation groups.

Table 2. Multivariable[1] risk ratios of experiencing unemployment or lacking health insurance or lacking healthcare access in a cohort of U.S. males and females by sex/gender and sexual orientation (N=9,914).

	Relative risk (95% CI)			
Female (N=6,663)	Completely heterosexual (N=5,353)	Mostly heterosexual (N=1,037)	Bisexual (N=159)	Lesbian/Gay (N=114)
Unemployed/not working due to illness or disability in last year[2]	1.00 (ref)	1.68 (1.35, 2.09)	2.39 (1.56, 3.65)	1.84 (1.03, 3.27)
Uninsured (lacked health insurance) in last year[2]	1.00 (ref)	1.39 (1.04, 1.86)	3.76 (2.42, 5.85)	1.18 (0.49, 2.88)
Lacked a routine physical exam in the last year[2]	1.00 (ref)	1.12 (1.00, 1.25)	1.26 (0.98, 1.62)	1.17 (0.86, 1.58)
Male (N=3,251)	(N=2,805)	(N=268)	(N=25)	(N=153)
Unemployed/not working due to illness or disability in last year[2]	1.00 (ref)	1.82 (1.30, 2.54)	1.00 (0.25, 4.06)	1.49 (0.91, 2.45)
Uninsured (lacked health insurance) in last year[2]	1.00 (ref)	1.67 (1.10, 2.54)	NA[3]	2.21 (1.33, 3.65)
Lacked a routine physical exam in the last year[2]	1.00 (ref)	0.97 (0.81, 1.16)	0.77 (0.40, 1.49)	1.13 (0.90, 1.40)

[1]Adjusted for age, race/ethnicity, childhood household income (reported by mother in 2001), geographic region, and cohort; multiple imputation used for missing covariates.
[2]As reported in 2013.
[3]Every bisexual male reported health insurance coverage in 2013 so no risk ratio was computed.

Table 3 provides the RRs and 95%CIs for the association between sexual orientation identity and the risk of having poorer HRQL (index score<1 versus 1). Model 0 demonstrates that, after accounting for potential confounders, sexual minority females and males had elevated risk of less-than-full health relative to completely heterosexuals. The addition of unemployment (model 1), lacking health insurance (model 2), lacking routine physical exam (model 3), or all three of these combined (model 4), did not substantially attenuate the associations between sexual orientation and HRQL.

Table 3. Multivariable[1] risk ratios of experiencing less than full health (HRQL index score<1 versus HRQL index score=1) in a cohort of U.S. males and females by sex/gender and sexual orientation (N=9,914).

	Relative risk (95% CI)			
Female (N=6,663)	Completely heterosexual (N=5353)	Mostly heterosexual (N=1,037)	Bisexual (N=159)	Lesbian/Gay (N=114)
Model 0: Sociodemographics	1.00 (ref)	1.33 (1.27, 1.39)	1.53 (1.42, 1.65)	1.42 (1.29, 1.57)
Model 1: Model 0 + unemployed	1.00 (ref)	1.32 (1.26, 1.38)	1.51 (1.40, 1.62)	1.41 (1.28, 1.56)
Model 2: Model 0 + uninsured	1.00 (ref)	1.32 (1.27, 1.38)	1.50 (1.39, 1.61)	1.42 (1.29, 1.57)
Model 3: Model 0 + lacked routine physical exam	1.00 (ref)	1.33 (1.27, 1.39)	1.53 (1.42, 1.65)	1.42 (1.29, 1.57)
Model 4: Model 0 + unemployed + uninsured + lacked routine physical exam	1.00 (ref)	1.32 (1.26, 1.38)	1.48 (1.37, 1.60)	1.41 (1.28, 1.56)
Male (N=3,251)	(N=2,805)	(N=268)	(N=25)	(N=153)
Model 0: Sociodemographics	1.00 (ref)	1.46 (1.34, 1.60)	1.62 (1.29, 2.03)	1.43 (1.27, 1.60)
Model 1: Model 0 + unemployed	1.00 (ref)	1.43 (1.31, 1.57)	1.62 (1.28, 2.05)	1.41 (1.26, 1.58)
Model 2: Model 0 + uninsured	1.00 (ref)	1.46 (1.33, 1.59)	1.63 (1.29, 2.04)	1.42 (1.26, 1.59)
Model 3: Model 0 + lacked routine physical exam	1.00 (ref)	1.46 (1.34, 1.60)	1.62 (1.29, 2.03)	1.43 (1.27, 1.60)
Model 4: Model 0 + unemployed + uninsured + lacked routine physical exam	1.00 (ref)	1.43 (1.31, 1.56)	1.62 (1.28, 2.05)	1.41 (1.26, 1.58)

[1]Adjusted for age, race/ethnicity, childhood household income (reported by mother in 2001), geographic region, and cohort; multiple imputation used for missing covariates.

Table 4 presents results for the multivariable linear regression of HRQL restricted to those with less-than-full health (index score<1). The patterns were similar to those provided in Table 3 with sexual minorities having lower HRQL compared to their completely heterosexual peers, and these relationships were not substantially attenuated after accounting for the effects of unemployment, lacking health insurance, and lacking a routine physical exam.

Table 4. Multivariable[1] linear associations between sexual orientation and HRQL index score in young adulthood among those who reported less than full health (score<1) in a cohort of U.S. males and females by sex/gender (N=5,547).

| | β (standard error) | | | | | |
Females (N=3,908)	Mostly heterosexual (N=760)	p-value	Bisexual (N=134)	p-value	Lesbian/Gay (N=90)	p-value
Model 0: Sociodemographics	-0.010 (0.003)	<.001	-0.034 (0.008)	<.001	-0.026 (0.008)	0.002
Model 1: Model 0 + unemployed	-0.010 (0.003)	<.001	-0.033 (0.008)	<.001	-0.025 (0.008)	0.002
Model 2: Model 0 + uninsured	-0.010 (0.003)	<.001	-0.033 (0.008)	<.001	-0.026 (0.008)	0.002
Model 3: Model 0 + lacked routine physical exam	-0.010 (0.003)	<.001	-0.034 (0.008)	<.001	-0.025 (0.008)	0.002
Model 4: Model 0 + unemployed + uninsured + lacked routine physical exam	-0.009 (0.003)	<.001	-0.033 (0.008)	<.001	-0.025 (0.008)	0.002
Males (N=1,639)	(N=188)		(N=19)		(N=104)	
Model 0: Sociodemographics	-0.020 (0.006)	0.001	-0.021 (0.025)	0.40	-0.004 (0.006)	0.47
Model 1: Model 0 + unemployed	-0.019 (0.006)	0.002	-0.022 (0.025)	0.38	-0.003 (0.006)	0.54
Model 2: Model 0 + uninsured	-0.020 (0.006)	0.001	-0.022 (0.025)	0.38	-0.004 (0.006)	0.54
Model 3: Model 0 + lacked routine physical exam	-0.020 (0.006)	0.001	-0.021 (0.025)	0.40	-0.004 (0.006)	0.47
Model 4: Model 0 + unemployed + uninsured + lacked routine physical exam	-0.019 (0.006)	0.002	-0.022 (0.025)	0.38	-0.003 (0.006)	0.58

[1]Adjusted for age, race/ethnicity, childhood household income (reported by mother in 2001), geographic region, and cohort; multiple imputation used for any missing covariates; completely heterosexual is the reference.

DISCUSSION

Sexual minority females and males are more likely than heterosexuals to have been unemployed and uninsured in early adulthood. Within each of the five HRQL dimensions, sexual minorities were also more likely than their heterosexual peers to report worse health. These disparities are pervasive even in a U.S. population that predominantly holds high social status with regards to race/ethnicity and socioeconomic position.

The existing literature on sexual orientation-related employment disparities primarily focuses on its contribution to more poverty among sexual minorities compared to heterosexuals[4–6,13]. Sexual minority women, as well as sexual minority people of color, appear to be especially vulnerable to poverty. Badgett et al. documented that policies to reduce wage gaps between heterosexual men and various sexual minority groups, including women and people of color, can significantly reduce poverty[5]. Although there is limited research on sexual orientation and employment status, data from the 2010 American Community Survey compare male same-sex couples and female same-sex couples to different-sex couples, all of which are cohabitating. These data reveal that cohabitating women in same-sex couples are more likely than women or men in cohabitating different-sex couples to be unemployed or not in the labor force. An estimated 40.4% of cohabitating women in same-sex couples were unemployed or not in the force compared to 21.8% of cohabitating men in same-sex relationships and 25.5% of cohabitating women and men different-sex couples. Women in same-sex couples benefit the least from employment as a way out of poverty because even among employed groups, women are at the highest risk of being in poverty[6]. The present study's findings support these data among sexual minority women. We also found larger employment disparities among sexual minority men possibly because our sample was not restricted to cohabitating participants.

Other studies have documented sexual orientation-related disparities in health insurance and healthcare access. For example, one of the largest nationally representative samples recently revealed that women in same-sex relationships were significantly less likely than women in different-sex relationships to have health insurance or to have had a check-up in the last year. Men in same-sex relationships in that sample were also less likely than men in different-sex relationships to have health insurance but more likely to have a check-up in the last year[7]. The present study supports most of the same patterns and a similar magnitude of health insurance and healthcare access disparities. A number of other studies document these same health insurance and healthcare access disparities using a cohabitating-based approach[3,9,11,12] and these results have also been repeated in other non-cohabitating samples as well[4,8,10].   However, many of these studies use samples that have limited statistical power, collapse sexual minority subgroups (e.g., lesbians and bisexuals), and are restricted to older adults who are in cohabitating relationships. The present study overcomes those challenges with a large sample allowing for improved statistical power and stratified sexual minority subgroups during late adolescent and early adulthood.

Our findings support the previous research that has identified lower HRQL among sexual minorities[14–19] using other quality of life measures[31–35]. Bisexual and lesbian women in the U.S.-based NHS2 cohort had lower HRQL scores than heterosexuals[15]. Certain sexual minority groups, including bisexual women and heterosexual men with same-sex partners, had lower HRQL scores than their heterosexual peers without same-sex partners in the state-based Representative California Quality of Life Survey[16]. Men who have sex with men in a Swedish sample had lower psychosocial HRQL scores than their heterosexual peers[17]. Other studies among college students have also identified lower quality of life among sexual minority females and male including one sample from Nigeria[18] and another from Cuba, Norway, India, and South Africa[19]. Another study from Washington State was restricted to sexual minorities, and therefore lacked a heterosexual comparison group; in this sample, young bisexual women had worse HRQL than their lesbian peers but these patterns reversed during midlife when lesbians

had worse HRQL[36]. No previous research, outside of the GUTS cohort[14], has used the EQ-5D-5L but the magnitude of our observed sexual orientation-related HRQL index scores differences is comparable or larger than those seen across individuals categorized by age, race/ethnicity, income, and education[27].

The GUTS cohort is made up of children of NHS2 participants, so results in this sample may not generalize to other populations; this cohort is predominantly White race/ethnicity, their mothers are all nurses, and the majority of participant's annual household income during their childhood was ≥$75,000. Given this high social status, our estimates may underestimate the prevalence of unemployment, a lack of health insurance, a lack of healthcare access, and poor HRQL. However, the fact that these disparities are pervasive in a cohort that predominantly holds high social status is striking. While our focus was on employment, health insurance, and healthcare access, there may be other factors that mediate the sexual orientation-related HRQL disparities including bullying victimization, social status, and others[14]. Data were cross-sectional and limited on some of our variables such as health insurance and healthcare access. Future longitudinal studies could explore more detailed types of health insurance coverage as well as other measurements of healthcare access.

This study has a number of strengths including the large sample drawn from young adults living across the United States. Building off the recently published data of sexual orientation-related disparities of HRQL index scores[14], this is the first study to examine these disparities across HRQL domains and evaluate the role of additional factors including employment, health insurance, and healthcare access. Utilizing the EQ-5D-5L to measure HRQL allows the findings to be incorporated into cost-effectiveness research, which can inform public policy decisions.

These sexual orientation-related disparities in employment and health insurance in a population with high social status highlight the ubiquity of sexual orientation inequities in the employment and healthcare systems. The U.S. Supreme Court's recent expansion of marriage rights to adults nationwide in same-sex relationships should lessen some of the sexual orientation-related disparities in health insurance. However, the adverse effects of previous bans are likely to persist[37,38]. Additionally, 28 states across the U.S. currently have no employment non-discrimination law covering sexual orientation—3 of these states have laws preventing the passage or enforcement of local non-discrimination laws[20]. Until all people, regardless of sexual orientation, are treated equally in the eyes of the law with non-discrimination laws protecting employment as well as housing, public accommodations, and credit/lending, sexual orientation-related health disparities will persist.

Ethics Approval: This study was approved by the Brigham and Women's Hospital Institutional Review Board.

Data Sharing: No additional data available.

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STROBE Statement—Checklist of items that should be included in reports of *cohort studies*

	Item No	Recommendation	Page
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	4-6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4-6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	4-6
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	4-6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4-6
Bias	9	Describe any efforts to address potential sources of bias	4-6
Study size	10	Explain how the study size was arrived at	4
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4-6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	4-6
		(*b*) Describe any methods used to examine subgroups and interactions	4-6
		(*c*) Explain how missing data were addressed	4-6
		(*d*) If applicable, explain how loss to follow-up was addressed	4
		(*e*) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6-10
		(b) Give reasons for non-participation at each stage	6-10
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	6-7
		(b) Indicate number of participants with missing data for each variable of interest	5-6
		(c) Summarise follow-up time (eg, average and total amount)	4-6
Outcome data	15*	Report numbers of outcome events or summary measures over time	6-10
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear	6-10

		which confounders were adjusted for and why they were included	
		(*b*) Report category boundaries when continuous variables were categorized	6-10
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A

Discussion

Key results	18	Summarise key results with reference to study objectives	11-12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11-12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12
Generalisability	21	Discuss the generalisability (external validity) of the study results	12

Other information

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	12

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.

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Sexual orientation-related disparities in employment, health insurance, healthcare access, and health-related quality of life: a cohort study of U.S. male and female adolescents and young adults

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Title Page

Sexual orientation-related disparities in employment, health insurance, healthcare access, and health-related quality of life: a cohort study of U.S. male and female adolescents and young adults

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Keywords: Access to Health Care; Health Inequalities; Social Epidemiology; Quality of Life; Unemployment

ABSTRACT

Objectives: To investigate sexual orientation-related disparities in employment and healthcare including potential contributions from health-related quality of life (HRQL).

Setting: Growing Up Today Study, a U.S.-based longitudinal cohort begun in 1996; predominantly composed of participants who are white and of middle-to-high socioeconomic positions.

Participants: 9,914 participants 18-32 years old at the most recent follow-up questionnaire.

Primary outcome measure: In 2013, participants reported if, in the last year, they had been unemployed, uninsured, or lacked healthcare access (routine physical exam). Participants completed the EQ-5D-5L, a validated, preference-weighted measurement of HRQL. After adjusting for potential confounders, we used sex-stratified, log-binomial models to calculate the association of sexual orientation with employment, health insurance, and healthcare access while examining if these variables attenuated the sexual orientation-related HRQL disparities.

Results: Sexual minority females and males were about twice as likely as their respective heterosexual counterparts to have been unemployed and uninsured. For example, risk ratio (95% confidence interval) of uninsured bisexual females: 3.76 (2.42, 5.85) and unemployed mostly heterosexual males: 1.82 (1.30, 2.54). Routine physical examination was not different across sexual orientation groups ($p > 0.05$). All sexual minority subgroups had worse HRQL than heterosexuals ($p < 0.05$) across the five EQ-5D-5L dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression). Controlling for employment and health insurance did not substantially attenuate the existing sexual orientation-related HRQL disparities.

Conclusions: Research on sexual orientation-related disparities in employment and healthcare has often been limited to comparisons between cohabitating different- and same-sex adult couples, overlooking sexual minority subgroups (e.g., bisexuals versus lesbians), non-cohabitating populations, and young people. Less is known about sexual orientation-related disparities in HRQL including potential contributions from employment and healthcare. The current study documents that disparities in employment, health insurance, and various HRQL dimensions are pervasive across sexual minority subgroups, non-cohabitating couples, and youth in families of middle-to-high socioeconomic positions.

ARTICLE SUMMARY: STRENGTHS AND LIMITATIONS OF THIS STUDY

- Cohort has predominantly high social status so while findings can examine sexual orientation-related differences, they may underestimate the prevalence of unemployment, a lack of health insurance, a lack of healthcare access, and poor HRQL compared to other populations (e.g., low social status, elderly)
- There may be other factors that mediate the sexual orientation-related HRQL disparities including bullying victimization, social status, and others
- Data were cross-sectional and limited on some of our variables such as health insurance and healthcare access
- Includes a large sample drawn from young adults living across the United States
- This is the first study to examine these disparities across HRQL domains and evaluate the role of additional factors including employment, health insurance, and healthcare access

INTRODUCTION

  Nearly half of all sexual minorities (e.g., lesbian, gay, and bisexual individuals) report employment discrimination in their lifetime[1]. Discrimination, along with other social and economic barriers, can lead to unemployment and, subsequently, a lack of health insurance and healthcare access. All of these factors may contribute to poor health-related quality of life (HRQL), which is a critical measure of health status. Comparing HRQL across different subpopulations can highlight disparities as well as help to evaluate the cost effectiveness of policies or programs that reduce such disparities[2].

  Previous research has documented that, compared to heterosexuals, sexual minorities are more likely to: be unemployed, lack health insurance, and lack healthcare access[3–13]. However, these data are often limited to comparisons between cohabiting different-sex couples and same-sex adult couples, which precludes examination of differences in any other aspects such as among sexual minority subgroups (e.g., bisexuals versus lesbians), non-cohabiting groups, or young people. A few previous studies have also revealed that sexual minorities, on average, have worse quality of life than heterosexuals[14–19]. But, most of these data depend on limited measures of quality of life including measures like the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) which does not explicitly access HRQL, including its multiple dimensions (e.g., pain/discomfort, anxiety/depression). Additionally, few of these studies have examined potential mediators of the sexual orientation-related disparities in HRQL.

  Documenting such disparities can provide policymakers with evidence to inform legislation that can lessen health inequities. For example, over half of states across the U.S. currently have no employment non-discrimination law covering sexual orientation[20] and documenting employment disparities. Using research to document the downstream consequences of unemployment—health insurance, healthcare access, and HRQL—can aid policy makers in crafting the necessary legal changes to lessen these inequities, such as federal employment non-discrimination laws. Therefore, the goal of this study was to leverage data from a U.S.-based longitudinal cohort of adolescents and young adults (ages 18-32) to examine sexual orientation-related disparities in employment, health insurance, and healthcare access while evaluating their contributions to HRQL disparities.

METHODS
Study Population

  For the last 20 years, questionnaire data have been collected annually in the Growing Up Today Study (GUTS) from the female and male offspring of Nurses' Health Study 2 (NHS2) participants. The first wave of GUTS participants (GUTS1) was enrolled in 1996, when they were 9-14 years of age, and another wave of 9-16 year olds was enrolled in 2004 (GUTS2) making the entire cohort 18-32 years of age at the last questionnaire wave in 2013. We originally sent questionnaires to GUTS1 and 2 in alternating years but since 2013, we have combined GUTS1 and 2 into a single annual questionnaire. Participants' race/ethnicity is primarily white and most of their families report a middle-to-high household income (64% of participant's annual household income during their childhood was ≥$75,000).

  The current analysis was limited to GUTS participants who reported their sexual orientation and information on the measures of unemployment, health insurance, healthcare access, and HRQL between baseline and the end of follow-up in 2013 (N=9,914). This study was approved by the Brigham and Women's Hospital Institutional Review Board.

Measures
Sexual orientation

  Detailed information about sexual orientation has been repeatedly collected in GUTS 1 and 2 using an item adapted from the Minnesota Adolescent Health Survey[21], which asks

about feelings of attraction and identity. The item read "Which of the following best describes your feelings?" with the following response options: completely heterosexual (attracted to persons of the opposite sex), mostly heterosexual, bisexual (equally attracted to men and women), mostly homosexual, completely homosexual (gay/lesbian, attracted to persons of the same sex), and not sure.

Sexual orientation groups were modeled using the 2013 questionnaire data (the same questionnaire year as the latest outcome) as follows: completely heterosexual (reference group), mostly heterosexual, bisexual, and lesbian/gay (made up from the mostly homosexual and completely homosexual groups). Missing data were limited and imputed from previous questionnaire waves. Respondents endorsing "not sure" were excluded (n=69).

Unemployment

In 2010 (GUTS 1 only) and 2013, participants reported their employment status. Response options included: working full time, working part time, student, volunteering, military, unemployed/laid off/looking for work, staying at home with children/taking care of family, on maternity or family leave, and not working due to illness or disability. We categorized a participant as being unemployed/not working due to illness or disability in 2013 if they provided an affirmative response to the "unemployed/laid off/looking for work" item or the "not working due to illness or disability".

Lacking health insurance

The 2013 questionnaire asked participants whether they were covered by any kind of health insurance or healthcare plan (yes; no). We categorized a participant as lacking health insurance in 2013 if they reported no such coverage.

Lacking healthcare access through routine physical exam

Use of routine physical exams was measured by asking about timing of last routine physical exam in 2013. We categorized participants who reported their last routine physical exam occurred >12 months before the questionnaire completion as not having healthcare access through a routine physical exam.

HRQL

The 2013 questionnaire assessed HRQL using the EQ-5D-5L[22], which is a validated, preference-weighted measure. EQ-5D-5L is a standardized, generic instrument that is applicable to a wide range of health conditions and appropriate for use with adolescents and young adults. This measure can also be used to calculate quality-adjusted life years (QALYs) for economic analyses with U.S.-based population weights.

EQ-5D-5L assesses HRQL in five dimensions (mobility, self-care, usual activities, pain/discomfort, anxiety/depression) by having participants report a dimension-specific score (1=no problems, 2=slight problems, 3=moderate problems, 4=severe problems, and 5=extreme problems). Based on the EuroQol Group recommendations[23], each physical functioning dimension was dichotomized into a score of 1 being "no problems" versus scores of 2 to 5 being "any problems." The anxiety/depression dimension was dichotomized into scores of 1 to 2 being "none or slight problems" versus scores of 3 to 5 being "moderate, severe, or extreme problems," as has been done previously[24].

All five dimensions were then used to create a summary HRQL index score[25]. Because EQ-5D-5L value sets are not yet available for the U.S., in order to preference-weight the index score for U.S. populations we relied on another value set to map EQ-5D-5L responses to the previous version, the EQ-5D-3L[26]. This summary results in an index score that is calibrated to reflect the degree to which different health statuses are valued in the U.S. population overall. Index scores for the U.S. population range from most severe impairment on

all five dimensions, termed "worse than death" (value= -0.109), to full health (value=1.0)[27]. Previous research suggests that an index score difference as small as 0.02 points can have a clinically meaningful difference[28]. We also analyzed the HRQL index score after dichotomizing it as a score of 1 being "full health" versus <1 being "not full health."

Confounders
        Potential confounders included baseline age in years, race/ethnicity (White, another race/ethnicity), childhood socioeconomic position (annual household income from NHS2 report in 2001 [<$50,000; $50,000-$74,999; $75,000-$99,999; ≥$100,000]), sex/gender, marital status in 2013 (married; not married), region of residence (West, Midwest, South, or Northeast), and cohort (GUTS 1, 2). If a participant's data were missing for potential confounders, data were imputed from previous questionnaire years; if no such data were available for a participant then multiple imputation procedures were used.

Statistical Analysis
        We first examined cross-sectional mean differences in employment, health insurance, healthcare access, and HRQL measures across sexual orientation groups. Multivariate regression from log-binomial models was used for dichotomous outcomes to calculate risk ratios (RR) and 95% confidence intervals (95%CI). Linear regression with the robust sandwich estimator was used for continuous outcomes to calculate betas (β) and standard errors. In order to account for sibling clusters, we estimated the variance using generalized estimating equations (GEE) with a compound symmetry working correlation matrix.
        We calculated the risk ratios of experiencing unemployment, lacking health insurance, or lacking healthcare access by sexual orientation groups (referent=completely heterosexual), adjusted for potential confounders. Analyses for HRQL measures followed the previously used two-step approach[29,30] by first dichotomizing the index score (1 versus <1) and then using the continuous health index score in analyses restricted to those with lower HRQL (defined as health index scores <1). HRQL models were first adjusted for potential confounders and then adjusted for employment, health insurance, and healthcare access to explore attenuation. Previous research with this cohort[14] suggests possible effect modification of the sexual orientation and HRQL association by sex/gender but not by cohort so all analyses were stratified by sex/gender and adjusted for cohort. Analyses were conducted using SAS 9.3 (SAS Institute, Cary, NC).

Patient and Public Involvement
        The public, including patients and study participants, were not involved in setting the research question or the outcome measures, nor was the public involved in developing plans for the study's design, recruitment, or implementation. GUTS research results are regularly reported to study participants including through newsletters and other communications.

RESULTS
        Of the 9,914 participants in our sample, 7.5% were unemployed or not working due to illness or disability, 4.9% were uninsured, and 38.2% lacked healthcare access through a routine physical exam in the last year. As shown in Table 1, all of these outcomes varied by sexual orientation identity with sexual minorities having more unemployment, less health insurance, and less healthcare access (all *p*-values <0.01 except among men, where healthcare access was not statistically different across sexual orientation groups). The mean HRQL index score was 0.90 for females and 0.92 for males and varied by sexual orientation identity with sexual minorities having lower mean HRQL index scores compared to completely heterosexuals among both females and males (*p*-values <0.001). Within each of the five HRQL domains, sexual minority females and males were more likely than heterosexuals to report worse health

(*p*-values ranged from <0.001 to 0.02 except among men, where self-care was not statistically different across sexual orientation groups).

Table 1. Age standardized characteristics of a cohort of U.S. females and males by sex/gender and sexual orientation (N=9,914).

Female (N=6,663)	Completely heterosexual (N=5,353)	Mostly heterosexual (N=1,037)	Bisexual (N=159)	Lesbian/Gay (N=114)	p-value[1]
Age at baseline[2], mean years (SD), Range: 18-32	26.1 (3.6)	26.6 (3.4)	25.5 (3.6)	26.4 (3.5)	<0.001
Unemployed/not working due to illness or disability in last year[3], % (N)	5.9 (317)	10.5 (109)	14.5 (23)	10.5 (12)	<0.001
Uninsured (lacked health insurance) in last year[3], % (N)	3.9 (208)	5.7 (59)	13.8 (22)	4.4 (5)	<0.001
Lacked a routine physical exam in the last year[3], % (N)	32.0 (1,712)	36.1 (374)	40.3 (64)	37.7 (43)	0.01
HRQL[4] dimensions, % (N)					
Mobility ≥slight problems	3.2 (172)	5.6 (58)	13.2 (21)	10.5 (12)	<0.001
Self-care ≥slight problems	0.5 (28)	1.3 (13)	4.4 (7)	1.8 (2)	<0.001
Usual activities ≥slight problems	5.0 (267)	12.3 (127)	20.1 (32)	16.7 (19)	<0.001
Pain/discomfort ≥slight problems	26.5 (1,418)	36.8 (382)	42.1 (67)	44.7 (51)	<0.001
Anxiety/depression ≥moderate problems	12.3 (658)	22.6 (234)	36.5 (58)	29.0 (33)	<0.001
HRQL index score[5], mean (SD)	0.91 (0.09)	0.87 (0.09)	0.84 (0.11)	0.85 (0.10)	<0.001
Less than full health (HRQL index score<1)	54.6 (2,924)	73.3 (760)	84.3 (134)	79.0 (90)	<0.001
HRQL index score among those with less than full health, mean (SD)	0.84 (0.06)	0.83 (0.06)	0.80 (0.09)	0.81 (0.08)	<0.001
Male (N=3,251)	(N=2,805)	(N=268)	(N=25)	(N=153)	
Age at baseline[2], mean years (SD), Range: 18-32	25.9 (3.7)	26.1 (3.7)	24.6 (3.8)	25.9 (3.6)	0.26
Unemployed/not working due to illness or disability in last year[3], % (N)	7.8 (218)	15.3 (41)	8.0 (2)	11.1 (17)	<0.001
Uninsured (lacked health insurance) in last year[3], % (N)	5.2 (147)	9.7 (26)	0.0 (0)	11.1 (17)	<0.001
Lacked a routine physical exam in the last year[3], % (N)	48.8 (1,369)	47.8 (128)	36.0 (9)	54.9 (84)	0.26
HRQL[4] dimensions, % (N)					
Mobility ≥slight problems	3.1 (86)	6.3 (17)	8.0 (2)	2.6 (4)	0.02
Self-care ≥slight problems	0.6 (18)	1.1 (3)	4.0 (1)	0.0 (0)	0.11
Usual activities ≥slight problems	3.8 (107)	10.5 (28)	8.0 (2)	5.9 (9)	<0.001
Pain/discomfort ≥slight problems	25.4 (711)	38.8 (104)	32.0 (8)	24.2 (37)	<0.001
Anxiety/depression ≥moderate problems	10.2 (285)	25.8 (69)	24.0 (6)	28.1 (43)	<0.001
HRQL index score[4], mean (SD)	0.92 (0.09)	0.87 (0.11)	0.86 (0.12)	0.89 (0.09)	<0.001
Less than full health (HRQL index score<1)	47.3 (1,329)	70.2 (188)	76.0 (19)	68.0 (104)	<0.001
HRQL index score among those with less than full health, mean (SD)	0.84 (0.06)	0.82 (0.08)	0.82 (0.11)	0.84 (0.06)	<0.001

[1]p-value calculated using ANOVA for continuous variables and chi square test for categorical variables (including those with a zero frequency cell such as the self-care HRQL dimension).

[2]Multiple imputation used in subsequent analyses for any missing covariates data. Percent missing: race/ethnicity (1.2%), marital status (0.2%), socioeconomic position (17.8%), and geographic region (0.1%).

[3]As reported in 2013.

[4]Health-related quality of life (HRQL) measured by the EQ-5D-5L, a validated preference-weighted measure for U.S. populations.

[5]Possible scores ranged from -0.109 ("worse than death") to 1 ("full health").

Table 2 presents the RRs and 95%CIs for the association between sexual orientation and the risk of being unemployed, lacking health insurance, or lacking healthcare access, adjusted for potential confounders. Compared to heterosexuals, sexual minority females and males were about twice as likely as their respective heterosexual counterparts to have been unemployed and uninsuranced. For example, bisexual females were at a higher risk than heterosexual females of being uninsuranced [RR (95%CI): 3.76 (2.42, 5.85)] and mostly heterosexual males were more likely than heterosexual males to have been unemployed [RR (95%CI): 1.82 (1.30, 2.54)]. Use of a routine physical exam was not statistically different across sexual orientation groups.

Table 2. Multivariable[1] risk ratios of experiencing unemployment or lacking health insurance or lacking healthcare access in a cohort of U.S. males and females by sex/gender and sexual orientation (N=9,914).

	Relative risk (95% CI)			
Female (N=6,663)	Completely heterosexual (N=5,353)	Mostly heterosexual (N=1,037)	Bisexual (N=159)	Lesbian/Gay (N=114)
Unemployed/not working due to illness or disability in last year[2]	1.00 (ref)	1.68 (1.35, 2.09)	2.39 (1.56, 3.65)	1.84 (1.03, 3.27)
Uninsured (lacked health insurance) in last year[2]	1.00 (ref)	1.39 (1.04, 1.86)	3.76 (2.42, 5.85)	1.18 (0.49, 2.88)
Lacked a routine physical exam in the last year[2]	1.00 (ref)	1.12 (1.00, 1.25)	1.26 (0.98, 1.62)	1.17 (0.86, 1.58)
Male (N=3,251)	(N=2,805)	(N=268)	(N=25)	(N=153)
Unemployed/not working due to illness or disability in last year[2]	1.00 (ref)	1.82 (1.30, 2.54)	1.00 (0.25, 4.06)	1.49 (0.91, 2.45)
Uninsured (lacked health insurance) in last year[2]	1.00 (ref)	1.67 (1.10, 2.54)	NA[3]	2.21 (1.33, 3.65)
Lacked a routine physical exam in the last year[2]	1.00 (ref)	0.97 (0.81, 1.16)	0.77 (0.40, 1.49)	1.13 (0.90, 1.40)

[1]Adjusted for age, race/ethnicity, childhood household income (reported by mother in 2001), geographic region, and cohort; multiple imputation used for missing covariates.
[2]As reported in 2013.
[3]Every bisexual male reported health insurance coverage in 2013 so no risk ratio was computed.

Table 3 provides the RRs and 95%CIs for the association between sexual orientation identity and the risk of having poorer HRQL (index score<1 versus 1). Model 0 demonstrates that, after accounting for potential confounders, sexual minority females and males had elevated risk of less-than-full health relative to completely heterosexuals. The addition of unemployment (model 1), lacking health insurance (model 2), lacking routine physical exam (model 3), or all three of these combined (model 4), did not substantially attenuate the associations between sexual orientation and HRQL.

Table 3. Multivariable[1] risk ratios of experiencing less than full health (HRQL index score<1 versus HRQL index score=1) in a cohort of U.S. males and females by sex/gender and sexual orientation (N=9,914).

	Relative risk (95% CI)			
	Completely heterosexual (N=5353)	Mostly heterosexual (N=1,037)	Bisexual (N=159)	Lesbian/Gay (N=114)
Female (N=6,663)				
Model 0: Sociodemographics	1.00 (ref)	1.33 (1.27, 1.39)	1.53 (1.42, 1.65)	1.42 (1.29, 1.57)
Model 1: Model 0 + unemployed	1.00 (ref)	1.32 (1.26, 1.38)	1.51 (1.40, 1.62)	1.41 (1.28, 1.56)
Model 2: Model 0 + uninsured	1.00 (ref)	1.32 (1.27, 1.38)	1.50 (1.39, 1.61)	1.42 (1.29, 1.57)
Model 3: Model 0 + lacked routine physical exam	1.00 (ref)	1.33 (1.27, 1.39)	1.53 (1.42, 1.65)	1.42 (1.29, 1.57)
Model 4: Model 0 + unemployed + uninsured + lacked routine physical exam	1.00 (ref)	1.32 (1.26, 1.38)	1.48 (1.37, 1.60)	1.41 (1.28, 1.56)
Male (N=3,251)	(N=2,805)	(N=268)	(N=25)	(N=153)
Model 0: Sociodemographics	1.00 (ref)	1.46 (1.34, 1.60)	1.62 (1.29, 2.03)	1.43 (1.27, 1.60)
Model 1: Model 0 + unemployed	1.00 (ref)	1.43 (1.31, 1.57)	1.62 (1.28, 2.05)	1.41 (1.26, 1.58)
Model 2: Model 0 + uninsured	1.00 (ref)	1.46 (1.33, 1.59)	1.63 (1.29, 2.04)	1.42 (1.26, 1.59)
Model 3: Model 0 + lacked routine physical exam	1.00 (ref)	1.46 (1.34, 1.60)	1.62 (1.29, 2.03)	1.43 (1.27, 1.60)
Model 4: Model 0 + unemployed + uninsured + lacked routine physical exam	1.00 (ref)	1.43 (1.31, 1.56)	1.62 (1.28, 2.05)	1.41 (1.26, 1.58)

[1]Adjusted for age, race/ethnicity, childhood household income (reported by mother in 2001), geographic region, and cohort; multiple imputation used for missing covariates.

Table 4 presents results for the multivariable linear regression of HRQL restricted to those with less-than-full health (index score<1). The patterns were similar to those provided in Table 3 with sexual minorities having lower HRQL compared to their completely heterosexual peers, and these relationships were not substantially attenuated after accounting for the effects of unemployment, lacking health insurance, and lacking a routine physical exam.

Table 4. Multivariable[1] linear associations between sexual orientation and HRQL index score in young adulthood among those who reported less than full health (score<1) in a cohort of U.S. males and females by sex/gender (N=5,547).

| | β (standard error) | | | | | |
	Mostly heterosexual (N=760)	p-value	Bisexual (N=134)	p-value	Lesbian/Gay (N=90)	p-value
Females (N=3,908)						
Model 0: Sociodemographics	-0.010 (0.003)	<.001	-0.034 (0.008)	<.001	-0.026 (0.008)	0.002
Model 1: Model 0 + unemployed	-0.010 (0.003)	<.001	-0.033 (0.008)	<.001	-0.025 (0.008)	0.002
Model 2: Model 0 + uninsured	-0.010 (0.003)	<.001	-0.033 (0.008)	<.001	-0.026 (0.008)	0.002
Model 3: Model 0 + lacked routine physical exam	-0.010 (0.003)	<.001	-0.034 (0.008)	<.001	-0.025 (0.008)	0.002
Model 4: Model 0 + unemployed + uninsured + lacked routine physical exam	-0.009 (0.003)	<.001	-0.033 (0.008)	<.001	-0.025 (0.008)	0.002
Males (N=1,639)	(N=188)		(N=19)		(N=104)	
Model 0: Sociodemographics	-0.020 (0.006)	0.001	-0.021 (0.025)	0.40	-0.004 (0.006)	0.47
Model 1: Model 0 + unemployed	-0.019 (0.006)	0.002	-0.022 (0.025)	0.38	-0.003 (0.006)	0.54
Model 2: Model 0 + uninsured	-0.020 (0.006)	0.001	-0.022 (0.025)	0.38	-0.004 (0.006)	0.54
Model 3: Model 0 + lacked routine physical exam	-0.020 (0.006)	0.001	-0.021 (0.025)	0.40	-0.004 (0.006)	0.47
Model 4: Model 0 + unemployed + uninsured + lacked routine physical exam	-0.019 (0.006)	0.002	-0.022 (0.025)	0.38	-0.003 (0.006)	0.58

[1]Adjusted for age, race/ethnicity, childhood household income (reported by mother in 2001), geographic region, and cohort; multiple imputation used for any missing covariates; completely heterosexual is the reference.

DISCUSSION

Sexual minority females and males are more likely than heterosexuals to have been unemployed and uninsured in early adulthood. Within each of the five HRQL dimensions, sexual minorities were also more likely than their heterosexual peers to report worse health. These disparities are pervasive in a U.S. population that predominantly holds high social status with regards to race/ethnicity and socioeconomic position.

The existing literature on sexual orientation-related employment disparities primarily focuses on its contribution to more poverty among sexual minorities compared to heterosexuals[4–6,13]. Sexual minority women, as well as sexual minority people of color, appear to be especially vulnerable to poverty. Badgett et al. documented that policies to reduce wage gaps between heterosexual men and various sexual minority groups, including women and people of color, can significantly reduce poverty[5]. Although there is limited research on sexual orientation and employment status, data from the 2010 American Community Survey compare male same-sex couples and female same-sex couples to different-sex couples, all of which are cohabitating. These data reveal that cohabitating women in same-sex couples are more likely than women or men in cohabitating different-sex couples to be unemployed or not in the labor force. An estimated 40.4% of cohabitating women in same-sex couples were unemployed or not in the work force compared to 21.8% of cohabitating men in same-sex relationships and 25.5% of cohabitating women and men different-sex couples. Women in same-sex couples benefit the least from employment as a way out of poverty because even among employed groups, women are at the highest risk of being in poverty[6]. The present study's findings support these data revealing higher unemployment among sexual minority women compared to heterosexual women. We also found larger employment disparities among sexual minority men possibly because our sample was not restricted to cohabitating participants.

Other studies have documented sexual orientation-related disparities in health insurance and healthcare access. For example, one of the largest nationally representative samples recently revealed that women in same-sex relationships were significantly less likely than women in different-sex relationships to have health insurance or to have had a check-up in the last year. Men in same-sex relationships in that sample were also less likely than men in different-sex relationships to have health insurance but more likely to have a check-up in the last year[7]. The present study supports most of the same patterns and a similar magnitude of health insurance and healthcare access disparities. A number of other studies document these same health insurance and healthcare access disparities using a cohabitating-based approach[3,9,11,12] and these results have also been repeated in other non-cohabitating samples as well[4,8,10]. However, many of these studies use samples that have limited statistical power, collapse sexual minority subgroups (e.g., lesbians and bisexuals), and are restricted to older adults who are in cohabitating relationships. The present study overcomes those challenges with a large sample allowing for improved statistical power and stratified sexual minority subgroups during late adolescent and early adulthood.

Our findings support the previous research that has identified lower HRQL among sexual minorities[14–19] using other quality of life measures[31–35]. Bisexual and lesbian women in the U.S.-based NHS2 cohort had lower HRQL scores than heterosexuals[15]. Certain sexual minority groups, including bisexual women and heterosexual men with same-sex partners, had lower HRQL scores than their heterosexual peers without same-sex partners in the state-based Representative California Quality of Life Survey[16]. Men who have sex with men in a Swedish sample had lower psychosocial HRQL scores than their heterosexual peers[17]. Other studies among college students have also identified lower quality of life among sexual minority females and male including one sample from Nigeria[18] and another from Cuba, Norway, India, and South Africa[19]. Another study from Washington State was restricted to sexual minorities, and therefore lacked a heterosexual comparison group; in this sample, young bisexual women had

worse HRQL than their lesbian peers but these patterns reversed during midlife when lesbians had worse HRQL[36]. Research on sexual orientation-related HRQL disparities using the EQ-5D-5L is scare but this measure was used in two recent publications, one from the GUTS cohort[14] and another based on a sample in Barcelona, Spain[37]. The current findings support those two publications findings that sexual minorities participants presented worse HRQL than heterosexuals while the current study also adds new insights. For example, the previous GUTS publication did not include estimates of the different HRQL dimensions—nor the contribution from employment and healthcare—and the Spanish sample was not large enough to examine sexual minority subgroups.

In addition to the differences observed in the current study comparing sexual minorities to heterosexuals, there were also notable differences comparing males and females as well as across sexual orientation subgroups. Male participants were more likely than females to have lacked a physical exam within the last year but less likely than females to have experienced pain/discomfort (one of the five HRQL dimensions). These patterns align with existing literature on men being less likely than women to seek healthcare[38] and the prevalence of pain that women experience compared to men[39]. While the primary analyses examined sexual minority subgroups in relation to the completely heterosexual group, some striking patterns emerged comparing sexual minority subgroups to one another. For example, bisexual women were the most likely to have been uninsured (13.8%) compared to completely heterosexual (3.9%) women as well as compared to mostly heterosexual (5.7%) and lesbian (4.4%) women; *p*-value <0.001. These findings align with the literature documenting bisexuals often experience some of the highest burdens of adverse health, even compared to other sexual minority subgroups[40].

The GUTS cohort is made up of children of NHS2 participants, so results in this sample may not generalize to other populations; this cohort is predominantly White race/ethnicity, their mothers are all nurses, and the majority of participant's annual household income during their childhood was ≥$75,000. Given this high social status, our estimates may underestimate the prevalence of unemployment, a lack of health insurance, a lack of healthcare access, and poor HRQL. However, the fact that these disparities are pervasive in a cohort that predominantly holds high social status is striking. While our focus was on employment, health insurance, and healthcare access, there may be other factors that mediate the sexual orientation-related HRQL disparities including bullying victimization, social status, and others[14]. The lack of explanation in these disparities by HRQL in this cohort may be due to the participants' young age. Future research should explore how employment and healthcare may interact with age to drive worse HRQL as people age. Data were cross-sectional and limited on some of our variables such as health insurance and healthcare access. Future longitudinal studies could explore more detailed types of health insurance coverage as well as other measurements of healthcare access.

This study has a number of strengths including the large sample drawn from young adults living across the United States. Building off the recently published data of sexual orientation-related disparities of HRQL index scores[14], this is the first study to examine these disparities across HRQL domains and sexual minority subgroup while also evaluating the role of additional factors including employment, health insurance, and healthcare access. Utilizing the EQ-5D-5L to measure HRQL allows the findings to be incorporated into cost-effectiveness research, which can inform public policy decisions.

These sexual orientation-related disparities in employment and health insurance in a population with high social status highlight the ubiquity of sexual orientation inequities in the employment and healthcare systems. The U.S. Supreme Court's recent expansion of marriage rights to adults nationwide in same-sex relationships should lessen some of the sexual orientation-related disparities in health insurance. However, the adverse effects of previous bans are likely to persist[41,42]. Additionally, 28 states across the U.S. currently have no employment non-discrimination law covering sexual orientation—3 of these states have laws preventing the passage or enforcement of local non-discrimination laws[20]. Until all people,

regardless of sexual orientation, are treated equally in the eyes of the law including with non-discrimination laws protecting employment as well as housing, public accommodations, and credit/lending, sexual orientation-related health disparities will persist.

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STROBE Statement—Checklist of items that should be included in reports of *cohort studies*

	Item No	Recommendation	Page
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	3
Methods			
Study design	4	Present key elements of study design early in the paper	3-5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3-5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	3-5
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	3-5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	3-5
Bias	9	Describe any efforts to address potential sources of bias	3-5
Study size	10	Explain how the study size was arrived at	3
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	3-5
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	3-5
		(*b*) Describe any methods used to examine subgroups and interactions	3-5
		(*c*) Explain how missing data were addressed	3-5
		(*d*) If applicable, explain how loss to follow-up was addressed	3
		(*e*) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	5-9
		(b) Give reasons for non-participation at each stage	5-9
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	5-6
		(b) Indicate number of participants with missing data for each variable of interest	4-5
		(c) Summarise follow-up time (eg, average and total amount)	3-5
Outcome data	15*	Report numbers of outcome events or summary measures over time	5-9
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear	5-9

		which confounders were adjusted for and why they were included	
		(*b*) Report category boundaries when continuous variables were categorized	6-10
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A

Discussion

Key results	18	Summarise key results with reference to study objectives	10
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11-12
Generalisability	21	Discuss the generalisability (external validity) of the study results	11-12

Other information

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	12

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.